

## Social Indicators of Fishing Community Vulnerability and Resilience: An Emergent Method for Fisheries Social Impact Assessment in the United States

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### Summary

Viable measures of social well-being and sustainability, including measures of vulnerability and resilience, are needed for coastal fishing communities. Although sustainable development indices have been created and implemented at national and regional levels, few are available at the local or community level. Even fewer address fisheries, especially United States fisheries. Data from more than 2,900 U.S. coastal communities in 19 states were used to create quantitative social vulnerability and fishing dependence indices. The development, utility, and validity of these indices for social impact assessments of fishing communities will be discussed in the context of stock and ecosystem assessments.

### Introduction

A challenge for the use of ecosystem approaches to management of marine resources is to find practical methods to link assessments of human and natural systems within a combined social-ecological system. A key component of this linkage is the ability of coastal communities and economies to respond to both marine ecosystem change and management decisions. A goal of NOAA Fisheries is to understand the resilience of United States coastal communities and economies and thus their adaptability to the impacts of new regulations and changing environmental conditions. To meet this goal, 9 indices of social vulnerability and 4 of fishing dependence were developed for more than 2,900 coastal communities in the Eastern United States (Jepson and Colburn 2013). Together, these Community Social Vulnerability Indicators (CSVIs) fall into three categories: 1) social vulnerability indices that represent social factors such as poverty and population composition that can affect an individual or community's ability to respond and adapt to change or disruptions; 2) gentrification pressure vulnerability indices that characterize factors such as changing population demographics and infrastructure in coastal areas that over time may represent a threat to the sustainability of a commercial or recreational fishing working waterfront (Colburn and Jepson 2012; Clay and Olson 2008); and 3) the fishing dependence indices that represent community engagement and reliance on commercial and recreational fishing.

### Materials and Methods

The indicators have been created for Northeast, Southeast and Gulf Coast regions of the United States (see Explore the Indicators at <http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/index>) and are in the process of being developed for all communities in United States coastal counties. Seventy-five different variables from seven secondary data sources were used to develop the indices using a single solution factor analysis. The CSVIs are assembled annually using demographic data from the United States Census' American Community Survey (ACS) five-year estimates, NOAA Fisheries' annual commercial fisheries and Marine Recreational Information Program (MRIP) data, along with a small number of publically available online databases. Ongoing data collection will allow the CSVIs to be continually updated to show long term trends. The ACS 2005-2009 5-year estimate data was used as the baseline and will be compared to the 2010 -2014 5-year estimates once they are available. Qualitative methods were used to establish the external validity of the quantitative results. Using cluster analysis, twenty communities were selected for

groundtruthing. Over 500 participants answered open-ended questions. This information was then coded and statistically analyzed. Results indicate that the statistically derived indices accurately reflected the concepts being measured.

### **Results and Discussion**

The CSVIs are derived from existing and measurable social factors that can influence either an individual or a community's ability to respond and adapt to change and, in particular, to changes in fishing regulations. By 2015, a subset of these indicators will be calculated for all United States coastal county communities. Because these indicators have been derived from commonly available existing sources (primarily United States Census data) they have wide applicability and can be readily updated. Indices of climate change vulnerability are also in development. Although widely-used indices of vulnerability and sustainability have been developed at national and regional levels, our research focused on community-level indicators. Such indicators are essential to systematically assess the social impacts of changing access to fishery resources resulting from regulatory changes and environmental conditions. These indicators are being used widely within NOAA Fisheries and may provide guidance for development of similar indices in other countries.

### **References**

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